UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/526,444	03/01/2005	Uwe Bernhard Stein	4941-P03582US0	3127

23117 7590 02/18/2010

NIXON & VANDERHYE, PC
901 NORTH GLEBE ROAD, 11TH FLOOR
ARLINGTON, VA 22203

EXAMINER	
KASTURE, DNYANESH G	

ART UNIT	PAPER NUMBER
3746	

MAIL DATE	DELIVERY MODE
02/18/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/526,444	STEIN ET AL.	
	Examiner	Art Unit	
	DNYANESH KASTURE	3746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 January 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-67* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-67* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 March 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *04 Jan 10*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 04 January 2010 has been entered.

Claim Objections

2. The phrase "successive cycles of working chamber volume" is not clear in Claims 1, 7, 27, 46, 47 and 67. The phrase -- successive cycles of changing working chamber volume -- is suggested instead. In Claims 38 and 59, the phrase "until almost the end of a stroke" is not clear, the phrase -- until near the end of a stroke – is suggested instead.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 2, 5, 6, 8, 12, 13, 17, 18, 20, 21, 24, 26, 31, 32, 36, 37, 39, 40, 43, 45, 48, 52, 53, 57, 68, 60, 61 and 66 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. In Re Claims 2, 5, 6, 8, 12, 13, 26, 31, 32, 45, 48, 52, 53 and 66, the word "small" in the phrase "small fraction" is indefinite. In Re Claims 5 and 6, "partial pumping mode" and "partial motoring mode" lacks antecedent basis. In Re Claim 17, 36 and 57, the word "occasional" in the phrase "occasional full modes" is indefinite. In Re Claims 18, 37 and 58, the word "mixed" in the phrase "idle modes, part modes and full modes are mixed" is indefinite. The following is suggested instead: -- a combination of some or all of idle modes, part modes and full modes is employed --. Further, In Re Claim 18, the range: "below full output but above a fixed or variable threshold" and "falls below a fixed or variable threshold" is indefinite. In Re Claims 20, 39 and 60, the phrase "extends over a range limited by stability" is indefinite. The following is suggested instead: -- is in a range that provides stability --. In Re Claims 21, 40 and 61, the phrase "extends over a range limited by machine noise" is indefinite. The following is suggested instead: -- is in a range that limits machine noise --. In Re Claims 24 and 43, "the mixture of modes" is indefinite. The following is suggested instead: -- the selection of modes --.

6. Please also note the following inconsistencies: Claim 6 is with reference to the partial motoring mode which opens the valve "fraction after the top dead center", whereas at least in Claims 12, 26 and 31 refer to the partial motoring mode which opens the valve "fraction in advance of the top dead center" which really relates to the partial pumping mode.

7. In addition, for the dependent claims that lack antecedent basis, it is assumed that the limitations of Claim 3 are incorporated into independent Claim 1.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sturman (US Patent 6,183,207 B1) in view of Nippert (US Patent 6,651,545 B2) and as extrinsically evidenced by Salter et al (US Patent 5,259,738 A indirectly referenced in applicant's disclosure of prior art)

10. In Re Claim 1, Sturman discloses a fluid-working machine (title: "digital pump") having a plurality of working chambers (in 14, 16, 18, 20) of cyclically changing volume, a high-pressure fluid manifold (38) and a low-pressure fluid manifold (36) - they are manifolds because Column 2, Lines 35-37 state: "the pump may have a single inlet port and a single outlet port that are arranged in fluid communication with the pump chambers by passages in the pump housing 12", at least one valve (40, 44, 46) on the inlet side linking each working chamber to each manifold, and an electronic sequencing controller (48) for operating (intended use language) said valves in timed relationship with the changing volume of each chamber, wherein the electronic sequencing controller has a configuration to operate the valves of each chamber in one of an idling mode ("by-pass state" - Column 3, Line 15 and Line 22) and a full mode (Column 3,

Line 23: "only the first pump assembly 14 is pumping fluid out") in which all of the usable volume of the chamber is used

- and the electronic sequencing controller has a configuration to select the mode (Sturman discloses at least three different combinations of chambers in full/idle mode – Column 3, Lines 20-29) of each chamber on successive cycles of working chamber volume so as to vary the time averaged effective flow rate of fluid through the machine as suggested in Column 3, Lines 14-15: "In this manner, the controller 48 can define a number of different modes" and Column 3, Lines 29-30: "The various modes may each provide a different output flowrate for the pump"; with regards to the limitation "on successive cycles of working chamber volume" Sturman states that the selection is made during operation ("without changing the speed of the shaft" – Column 3, Line 33) where cycles of changing volume are occurring continuously and consecutively, and it would be obvious to one of ordinary skill not to interrupt a cycle for a chamber in a FULL mode until it has completely displaced its volume (cycle complete) otherwise there could exist a flowrate that was never intended. Salter et al provides further evidence thereof in Column 6, Lines 49-55: "It will, for example, be possible to programme the operation of a pump so that its output varies from cycle to cycle. Alternatively, a pump can be divided into a number of independently operable sections each comprising a plurality of cylinders. Each section can be independently controlled as to displacement .."

11. However, Sturman does not disclose a partial mode in which only part of the usable volume of the chamber is used.

12. Nevertheless, Nippert discloses in Column 8, Lines 43-47: "The displacement of the fluid pump 12 can also be varied by controlling the volume that EACH piston 46 can produce. This is accomplished by permitting the selected one or ones of the pistons 46 to effectively PUMP A PORTION of their total volume and BYPASS THE REMAINING portion"

13. It would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the operation of any of the pump sub assemblies (14, 16, 18, 20) of Sturman so that the working chambers (24) only pump a portion of their total volume and bypass the remaining portion (by switching valve 46 part way through the exhaust stroke so that member 44 is exposed to the high pressure port and opens the inlet check valve 40) for the purpose of providing more variety of displacements to choose from because an additional partial pumping mode is now available.

14. Note that one of ordinary skill would not be motivated to always operate the modified device in a partial mode (ignoring full and idle) because it would destroy the "digital" operation (title) of the device.

15. In Re Claim 2, determining the precise fraction of usable volume in the partial mode would have been obvious to a person having ordinary skill in the art since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art - MPEP 2144.05 (II-B).

16. Claims 25 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nippert (US Patent 6,651,545 B2) in view of Salter et al (US Patent 5,259,738 A indirectly referenced in applicant's disclosure of prior art) and as extrinsically evidenced by Mestieri (US Patent 4,945,816 A)

17. In Re Claims 25 and 44, Nippert discloses a fluid-working machine (title: "fluid translating device) comprising a plurality of working chambers (48) of cyclically changing volume, said working chambers comprising cylinders (44) within which pistons (46) are arranged to reciprocate, a high-pressure fluid manifold (54); a low-pressure fluid manifold (52); at least one valve (64, 66) linking each working chamber to each manifold ("B", "D", "F" and "A", "C", "E" in Figure 4),

- a controller (24) having a configuration to operate the valves of at least one of said working chambers in a partial motoring mode in which only part of the usable volume of the at least one working chamber is used as implied by the following two statements: Column 7, Lines 34-36: "the operation thereof is described with it being used as a fluid pump 12. However, it is recognized that it is also applicable as a fluid motor" and Column 8, Lines 43-47: "The displacement of the fluid pump 12 can also be varied by controlling the volume that each piston 46 can produce. This is accomplished by permitting the selected one or ones of the pistons 46 to effectively pump a portion of their total volume and bypass the remaining portion". From these two statements, it should be obvious to one of ordinary skill that pumping a portion of the total volume and bypassing the rest when the device is operated as a pump is analogous to motoring the

piston using a portion of the total volume and bypassing the rest when the device is operated as a fluid motor. Mestieri provides additional evidence that a partial motoring mode for a fluid motor can be created simply by manipulation of the controlling valves as suggested in Column 5, Lines 1-5: "Additionally a "variable displacement" mode can be effected by appropriate control of valves 30 by controller 52 in response to the information in the in-board computer 64 received from disc 20, to meet REDUCED TORQUE requirements"

18. In any case, Salter et al discloses a partial motoring mode in Column 4, Lines 30-31 ("partially disabled motor") and in Lines 63-68: "..close the high-pressure valve 30 part way through the power stroke. The low-pressure valve 40 will then be opened by the pressure differential for the remaining stroke until the piston 12 reaches bottom-dead-centre. The controller 20, if it continues to play its motor role, will leave the low-pressure valve open for the discharge stroke". The Nippert apparatus can therefore be operated in accordance with this Salter et al teaching in the following manner: At the start of the power stroke, the piston is in the TDC position, the low pressure valve 64 is closed and high pressure valve 66 is opened. As a result, high pressure fluid enters the chamber and the piston is motored (starts moving) towards to BDC position. Part way through the power stroke, the high pressure valve 66 is closed and the low pressure valve 64 is opened for the remainder of the stroke until the piston reaches BDC. The controller (24), if it continues to play its motor role, will leave the low-pressure valve 66 open for the discharge stroke. This operation is clearly the partial motoring mode and not the full motoring mode.

19. It would have been obvious to a person having ordinary skill in the art at the time of the invention to program the controller of Nippert to operate the high and low pressure valves in the partial motoring mode as suggested by Salter et al in a manner described above because it has been successfully implemented in the prior art of fluid displacement devices that can be operated as pumps or fluid motors. If the modification leads to anticipated success, it is likely the product of ordinary skill and common sense and not the product of innovation.

20. Claims 3 - 67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sturman (US Patent 6,183,207 B1) in view of Salter et al (US Patent 5,259,738 A indirectly referenced in applicant's disclosure of prior art) and further in view of Nippert (US Patent 6,651,545 B2)

21. In Re Claim 3, Sturman as applied to Claim 1 above discloses all the claimed limitations except for full and partial motoring modes and a partial pumping mode.

22. Nevertheless, Salter et al discloses a fluid working machine that is capable of motoring or pumping simply by revising the valve actuation cycle as suggested in Column 4, Lines 7-8: "it could transform the motor into a pump by revising the valve actuation cycle". Further, Salter et al also discloses a partial motoring mode in Column 4, Lines 30-31 ("partially disabled motor") and in Lines 63-68: "..close the high-pressure valve 30 part way through the power stroke. The low-pressure valve 40 will then be

opened by the pressure differential for the remaining stroke until the piston 12 reaches bottom-dead-centre. The controller 20, if it continues to play its motor role, will leave the low-pressure valve open for the discharge stroke".

23. It would have been obvious to a person having ordinary skill in the art at the time of the invention to substitute the inlet valves (40, 44, 46) and outlet valves (42) of every pump subassembly of Sturman with the electromagnetic valves (13, 15) of Salter et al for the purpose of making the device of Sturman more versatile by functioning as a fluid motor or a pump. The added motoring and partial motoring features in the modified apparatus provides more variety of displacements to choose from to meet Sturman's objective of providing the desired flow rate (Column 3, Lines 29-30: "The various modes may each provide a different output flow rate"). Note that the enabling and disabling of cylinders (through the bypass state in the pump configuration of Sturman) would still be available when the motoring mode is added as suggested in Column 4, Lines 22-25: "A motor according to this invention would allow cylinder disabling in much the same way as is described in the aforesaid European patent application for a pump"

24. Sturman modified by Salter et al as discussed above discloses all the claimed limitations except for the partial pumping mode.

25. Nevertheless, Nippert discloses in Column 8, Lines 43-47: "The displacement of the fluid pump 12 can also be varied by controlling the volume that EACH piston 46 can produce. This is accomplished by permitting the selected one or ones of the pistons 46 to effectively PUMP A PORTION of their total volume and BYPASS THE REMAINING portion".

26. It would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the operation of any of the pump sub assemblies (14, 16, 18, 20) of Sturman so that the working chambers (24) only pump a portion of their total volume and bypass the remaining portion for the purpose of providing more variety of displacements to choose from because an additional partial pumping mode is now available.

27. In Re Claim 4, Sturman discloses chambers (24) and Nippert discloses piston bores (44) and Salter et al discloses cylinders (11) in which the pistons are arranged to reciprocate.

28. In Re Claim 5, Nippert teaches a machine according to claim 4 (see the rejection of claim 4 above), wherein partial pumping mode includes closing the valve linking the cylinder to the low-pressure manifold and opening the valve linking the cylinder to the high-pressure manifold a small fraction in advance of the top dead centre position of the piston (Nippert discloses that in partial pumping mode it is possible to pump a first portion of the volume, bypass an intermediate portion, and pump the remaining portion. That is, after the bypassed portion, the high pressure valve would need to open to allow the fluid to be pumped, while the low pressure valve would need to close to prevent the bypass effect.). ALTERNATIVELY, determining precisely when to actuate the valves during the stroke (fraction in advance of TDC) would have been obvious to a person having ordinary skill in the art since it has been held that discovering an optimum value

of a result effective variable involves only routine skill in the art - MPEP 2144.05 (II-B).

29. In Re Claim 6, Nippert teaches a machine according to claim 4 (see the rejection of claim 4 above), wherein partial motoring mode includes closing the valve linking the cylinder to the high-pressure manifold and opening the valve linking the cylinder to the low- pressure manifold a small fraction after the top dead centre position of the piston (Partial motoring mode operates in a manner similar to partial pumping mode. Therefore it would be possible to use a first portion of the volume to create rotary motion, bypass an intermediate portion, and use the remaining portion of the volume to create motion. Thus, after the bypassed portion, the low pressure valve would need to open to allow the fluid to be pumped, while the high pressure valve would need to close to prevent the bypass effect.). ALTERNATIVELY, determining precisely when to actuate the valves during the stroke (fraction after the TDC) would have been obvious to a person having ordinary skill in the art since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art - MPEP 2144.05 (II-B).

30. In Re Claim 7, Sturman, Nippert and Salter et al as applied to Claim 3 discloses all the claimed limitations because MPEP 2112.02 states that under the principles of inherency, if a prior art device, in its normal and usual operation, would necessarily perform the method claimed, then the method claimed will be considered to be anticipated by the prior art device.

31. In Re Claim 8, determining the precise fraction of usable volume in the partial mode would have been obvious to a person having ordinary skill in the art since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art - MPEP 2144.05 (II-B). Sturman, Nippert and Salter et al as applied to Claim 3 discloses all the claimed limitations because MPEP 2112.02 states that under the principles of inherency, if a prior art device, in its normal and usual operation, would necessarily perform the method claimed, then the method claimed will be considered to be anticipated by the prior art device.

32. In Re Claim 9, Salter et al teaches solenoid actuated valves that control the flow of fluid to each pumping chamber. These valves are actuated by a controller (20) that contains "several built-in algorithms which enable the unit to compare the pump system demand characteristics with system feedback (see column 5 lines 36-55). The controller's decision to operate each valve occurs every cycle of the pump's operation (see column 6 lines 41-48). Therefore it would have been obvious to one having ordinary skill in the art that the number of chambers to be operated is chosen by an algorithm.

33. In Re Claim 10, Nippert and Salter et al. teaches a method according to claim 9 (see the rejection of claim 9 above), including a preliminary step of selecting whether to operate the machine as a pump or a motor, and choosing the algorithm accordingly (Since the apparatus cannot be operated as both a pump and a motor at the same time,

a decision would need to be made to determine which mode the apparatus would operate in. A pumping algorithm would be necessary when the apparatus is operated in pump mode, and a motoring algorithm would be necessary when the apparatus is operated in motor mode.).

34. In Re Claim 11, Sturman, Nippert and Salter et al as applied to Claim 3 discloses all the claimed limitations because MPEP 2112.02 states that under the principles of inherency, if a prior art device, in its normal and usual operation, would necessarily perform the method claimed, then the method claimed will be considered to be anticipated by the prior art device.

35. In Re Claim 12, Sturman, Nippert and Salter et al as applied to Claims 3, 4, 6 and 11 discloses all the claimed limitations.

36. In Re Claim 13, Sturman, Nippert and Salter et al as applied to Claims 3, 4, 5 and 11 discloses all the claimed limitations.

37. In Re Claim 14, Sturman, Nippert and Salter et al as applied to Claims 3 and 7 discloses all the claimed limitations.

38. In Re Claim 15, Salter et al as applied to Claim 9 discloses determining system demand and controlling the valves of each piston and cylinder accordingly (by

enabling/disabling or partial modes). Determining the precise fraction of partial stroke modes to idle modes would have been obvious to a person having ordinary skill in the art since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art - MPEP 2144.05 (II-B).

39. In Re Claim 16, it would be obvious to one of ordinary skill that more flow requires more partial strokes for the same amount of idling strokes thereby increasing the fraction. Also, the manner of operating a device does not distinguish it over prior art.

40. In Re Claim 17, it would be clear to one of ordinary skill that if the flow demand is extremely high, full modes may be necessary and that idle and part modes only may not be sufficient. Once again, determining the precise amounts of full modes, partial modes and idle modes would have been obvious to a person having ordinary skill in the art since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art - MPEP 2144.05 (II-B).

41. In Re Claim 18, as best understood, determining the precise amounts of full modes, partial modes and idle modes without undue experimentation would have been obvious to a person having ordinary skill in the art since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art - MPEP 2144.05 (II-B).

42. In Re Claim 19, Salter et al discloses in Column 3, Lines 28-30: "When the piston 12 is ALMOST at bottom-dead-centre, the controller 20 sends a pulse to close the high-pressure valve 30".

43. In Re Claims 20 and 21, determining the range of fractional volume that provides stability or limits machine noise would have been obvious to a person having ordinary skill in the art since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art – MPEP 2144.05 (II-A).

44. In Re Claim 22, Salter et al distinguishes between a partly disabled motor and a fully enabled one (Column 4, Lines 30-32), and Nippert discloses two different partial pumping modes in Column 8, Lines 47-49, thereby distinguishing it from the full pumping mode.

45. In Re Claim 23, Salter et al discloses that valve actuation occurs near the BDC in the motoring mode (Column 3, Lines 28-30). It would have been obvious to one of ordinary skill to apply the motoring mode teachings to the pumping mode because "the staging of valve timing to ensure a small pressure difference across the valves is very important in practice" (Column 3, Lines 42-44 of Salter et al).

46. In Re Claim 24, Salter et al discloses a "noise algorithm" that reduces shock waves which would motivate one of ordinary skill to select modes accordingly. Salter et al also discloses a pressure control mode (Column 6, Line 10).

47. ALTERNATIVELY in Re Claims 25 and 44, Sturman, Nippert and Salter et al as applied to Claims 14 and 3 respectively discloses all the claimed limitations because these claims are broader.

48. In Re Claims 26 and 45, Sturman, Nippert and Salter et al as applied to Claims 12 and 6 respectively discloses all the claimed limitations.

49. In Re Claim 27, Sturman, Nippert and Salter et al as applied to Claims 14 and 15 discloses all the claimed limitations.

50. In Re Claim 28, Sturman, Nippert and Salter et al as applied to Claims 3 and 9 disclose all the claimed limitations.

51. In Re Claim 29, Salter et al teaches solenoid actuated valves that control the flow of fluid to each pumping chamber. These valves are actuated by a controller (20) that contains "several built-in algorithms which enable the unit to compare the pump system demand characteristics with system feedback (see column 5 lines 36-55). The controller's decision to operate each valve occurs every cycle of the pump's operation

(see column 6 lines 41-48). Therefore it would have been obvious to one having ordinary skill in the art that the number of chambers to be operated is chosen by an algorithm.

52. In Re Claim 30, Sturman, Nippert and Salter et al as applied to Claims 3 and 11 disclose all the claimed limitations.

53. In Re Claim 31, Sturman, Nippert and Salter et al as applied to Claims 30, 4 and 6 disclose all the claimed limitations.

54. In Re Claim 32, Sturman, Nippert and Salter et al as applied to Claims 3, 4 and 5 disclose all the claimed limitations.

55. In Re Claim 33, Sturman, Nippert and Salter et al as applied to Claims 3 and 14 disclose all the claimed limitations.

56. In Re Claim 34, Sturman, Nippert and Salter et al as applied to Claims 3 and 15 disclose all the claimed limitations.

57. In Re Claim 35, Sturman, Nippert and Salter et al as applied to Claims 3 and 16 disclose all the claimed limitations.

58. In Re Claim 36, Sturman, Nippert and Salter et al as applied to Claims 3 and 17 disclose all the claimed limitations.

59. In Re Claim 37, Sturman, Nippert and Salter et al as applied to Claims 3 and 18 disclose all the claimed limitations.

60. In Re Claim 38, Sturman, Nippert and Salter et al as applied to Claims 3 and 19 disclose all the claimed limitations.

61. In Re Claim 39, Sturman, Nippert and Salter et al as applied to Claims 3 and 20 disclose all the claimed limitations.

62. In Re Claim 40, Sturman, Nippert and Salter et al as applied to Claims 3 and 21 disclose all the claimed limitations.

63. In Re Claim 41, Sturman, Nippert and Salter et al as applied to Claims 3 and 22 disclose all the claimed limitations.

64. In Re Claim 42, Sturman, Nippert and Salter et al as applied to Claims 3 and 23 disclose all the claimed limitations.

65. In Re Claim 43, Sturman, Nippert and Salter et al as applied to Claims 3 and 24 disclose all the claimed limitations.

66. In Re Claim 46, Sturman, Nippert and Salter et al as applied to Claims 3 and 27 disclose all the claimed limitations.

67. In Re Claim 47, Salter et al discloses computer controlled poppet valves (Column 1, Line 66) and that the controller is programmed (Column 4, Lines 4-5) to perform the valve actuation cycle. This implies the presence of a computer readable storage medium that stores the computer program related to operation of the controller. Sturman, Nippert and Salter et al as applied to Claim 1 discloses all the claimed limitations. Further, it is assumed that the applicant is claiming a NON-TRANSITORY computer readable storage medium since the specification refers to a microprocessor.

68. In Re Claim 48, determining the precise fraction of usable volume in the partial mode would have been obvious to a person having ordinary skill in the art since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art - MPEP 2144.05 (II-B).

69. In Re Claims 49-67, Sturman, Nippert and Salter et al as applied to Claims 28-46 respectively and as applied to Claim 47 discloses all the claimed limitations.

Response to Arguments

70. Applicant has argued that none of the references discloses what mode should be selected on successive cycles of changing working chamber volume and that one of ordinary skill would use continuous partial cycles to provide the desired flow rate.

71. Examiner's Response: In view of the newly cited Sturman reference, one of ordinary skill would not always use continuous partial cycles because doing so would destroy the "DIGITAL" aspect of the Sturman device (see title) where a combination of full and idle strokes provides the desired flow rate. Instead the partial mode would be utilized for example to reduce the capacity of one of individual chamber, maintaining full/idle capacity on another.

72. Applicant has argued that in view of Figure 2 or 3 of Nippert does not allow changing mode of a cylinder from one cycle to the next, because these embodiments do not disclose any kind of pressure accumulator.

73. Examiner's Response: Even if it was not possible to change mode from one cycle to another in the Figures 2 and 3 embodiments due to the absence of a pressure accumulator, the Figure 1 embodiment does have pressure accumulators (HP and LP). Therefore in this embodiment, it is possible to change the mode from one cycle to the next.

74. Applicant has argued that it would be impossible to combine using "only a portion of the total volume" teaching with the purported motoring cycle of Nippert as the chamber would be sealed.

75. Examiner's response: The Nippert reference allows for the chamber to be hydraulically locked (Column 8, Line 59). In the example described by applicant, the partial motoring mode is unlocked when the rotation inertia of the cam (60) brings it back in contact with the piston and moves it back to TDC by exhausting the fluid through ball check (72). Since the actuators are de-energized in the exhaust stroke (Column 8, Lines 10-12), the biasing member (74) and ball (72) only functions as a check valve, thereby allowing the partially occupied chamber volume (as a result of the partial motoring action) to be exhausted. The partial motoring mode is therefore NOT incompatible with the motoring cycle discussed in Nippert.

76. The rest of applicant's arguments are moot in view of new grounds of rejection. All of applicant's arguments have been carefully considered, however, they are not persuasive in view of the above. The examiner therefore respectfully disagrees with applicant's arguments and maintains that the application is not in condition for allowance.

Conclusion

77. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: Wichert (US Patent 6,652,240 B2) discloses controlling multiple compressors to achieve desired volumetric flow rates. Widmaier (US Patent 3,643,433 A) discloses hydraulic units that can be operated as fluid motors or pumps.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DNYANESH KASTURE whose telephone number is (571)270-3928. The examiner can normally be reached on Mon-Fri, 9:00 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Devon Kramer can be reached on (571) 272 - 7118. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DEVON KRAMER/

Supervisory Patent Examiner, Art Unit 3746

DGK